

# MOBILE COMMUNICATION TERMINAL PROVIDED WITH HANDSFREE FUNCTION AND CONTROLLING METHOD THEREOF

## BACKGROUND OF THE INVENTION

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### 1. Field of the Invention

The present invention relates to a mobile communication terminal, and more particularly, to a mobile communication terminal provided with a hands-free  
10 function capable of originating a call or receiving a call by a user's voice command and a controlling method thereof.

### 2. Description of the Related Art

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Generally, a mobile communication terminal such as a cellular phone and a PCS phone is a communication device for transmitting and receiving a radio signal differently from a wire telephone. Recently, as the mobile communication terminal becomes small and light so as to be convenient for carrying, a user can originate a call or receive a call at any time.

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However, recently, it is regulated to directly use the mobile communication terminal at the time of driving since it may cause an unexpected accident due to an attention lowering. That is, when the user receives a call at the time of driving, the user has to press a button of the mobile communication terminal or open a folder by using hands, and when the user originates a call, eyes of the user have  
25 to be towards the mobile communication terminal with hands thus to lower the

user's attention.

By reflecting the direct use regulation for the mobile communication terminal, a hands-free function for calling in a predetermined space without directly holding the mobile communication terminal by hands or for charging a battery was  
5 developed.

A mounting unit of the hands-free is constructed to mount a microphone and a speakerphone to the mobile communication terminal, the microphone is mounted at a position near to the user, and the speakerphone is mounted at a position where the user can easily hear.

10 However, in case of additionally mounting the conventional hands-free, the microphone and the speakerphone have to be mounted and the hands-free has to be mounted by wire after changing an indoor structure, a garnish, and etc. in order to connect a battery power used in a vehicle and etc.

Also, in case of additionally mounting the conventional hands-free, the  
15 user has a cost burden for installing the hands-free.

## SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide a mobile  
20 communication terminal provided with a hands-free function capable of calling without a user's hands using at the time of originating a call or receiving a call while driving and a controlling method thereof.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein,  
25 there is provided a mobile communication terminal provided with a hands-free

function comprising: a key inputting means for inputting an operational command of a mobile communication terminal; a microphone for inputting a user's voice message; a display unit for displaying an operational state of the mobile communication terminal; a speakerphone for outputting a calling party's voice  
5 outside in a hands-free mode; and a control means for setting a calling mode according to the user's voice message, searching the calling party's name or telephone number according to the user's voice message and thereby voice-guiding through the speakerphone, and switching a calling path through the speakerphone to an earphone at the time of setting a secret calling.

10 A controlling method of a mobile communication terminal provided with a hands-free function comprises the steps of: setting a hands-free function of a mobile communication terminal; certifying whether an originating calling command or a calling from outside are received; searching information of a calling party inputted by a user's voice or originating party's information from a mounted  
15 telephone directory; and voice guiding the calling party's information and connecting a calling.

A controlling method of a mobile communication terminal provided with a hands-free function comprises the steps of: setting a hands-free function of a mobile communication terminal; switching a calling path to a speakerphone and  
20 certifying whether a user's voice command for originating a calling exists; searching inputted calling party's information and voice-guiding when the user's voice command is inputted; and connecting a calling to the calling party's telephone number and outputting the calling party's voice to the speakerphone.

A controlling method of a mobile communication terminal provided with a  
25 hands-free function comprises the steps of: setting a hands-free function of a

mobile communication terminal; switching a calling path to a speakerphone and certifying whether a calling from an arbitrary originating party is received; voice-guiding by obtaining the calling party's information and certifying whether a calling is allowable when the calling is received; and connecting a calling with the calling party and outputting the calling party's voice to the speakerphone when a user's voice command for a calling allowance is inputted.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Figure 1 is a block diagram of a mobile communication terminal according to an embodiment of the present invention;

Figure 2 is an exemplary view showing a mounting position of a speakerphone an embodiment of the present invention;

Figure 3 is a flow chart showing a secret call setting process according to an embodiment of the present invention;

Figure 4 is a flow chart showing a process for originating a call according

to an embodiment of the present invention;

Figure 5 is a flow chart showing a voice guiding and a telephone number selecting process at the time of searching a plurality of calling parties in Figure 4;

Figure 6 is a flow chart showing a voice guiding and a telephone number selecting process at the time of searching a plurality of telephone numbers in Figure 4;

Figure 7 is a flow chart showing a process for receiving a call according to an embodiment of the present invention;

Figure 8 is a flow chart showing call allowing and refusing processes of Figure 7; and

Figure 9 is a flow chart showing a call finishing process according to an embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

Hereinafter, a mobile communication terminal provided with a hands-free function and a controlling method thereof according to the present invention will be explained.

Figure 1 is a block diagram of a mobile communication terminal provided with a hands-free function according to an embodiment of the present invention.

As shown, the mobile communication terminal comprises a key inputting unit 110 for inputting a telephone number, a hands-free function setting, and a calling command; a microphone 140 for inputting a user's voice; a display unit 130

for displaying a menu screen, a calling situation, and etc.; a speaker 150 for outputting a calling party's voice; a speakerphone 160 for outputting a calling party's voice in a hands-free mode; and a micro computer 120 for controlling an operation of the mobile communication terminal according to a user's voice inputted to the microphone 140 in controlling an operation for a calling.

The micro computer 120 is provided with a wireless communication module, a video processing module, a display driving module, an audio processing module, and a calling path switching module for switching a calling path between the speaker 150 and the speakerphone 160 or switching a calling path between the speakerphone 160 and an earphone (not shown).

The micro computer 120 comprises a voice-guiding function for obtaining a calling party's information CID, thereby searching whether the information is registered in a telephone directory mounted in the mobile communication terminal, and guiding the search result by voice when a calling from an arbitrary originating party is received; a voice-dialing function for recognizing calling party's information inputted by the user's voice, thereby searching from the telephone directory, and guiding the search result by voice; a voice command function for recognizing a calling command such as a calling connection, a calling finishing, and etc. by a voice command; and a secret calling function for switching a calling path set as a speakerphone as an earphone according to the user's setting.

Figure 2 is an exemplary view showing a mounting position of a speakerphone an embodiment of the present invention, in which the speakerphone 160 is mounted at an upper side of a back side of the mobile communication terminal. At this time, the speakerphone has to be provided with an enough volume replaying capacity for a driver to hear a calling party's replaying

voice while driving even if the mobile communication terminal is positioned at any position in a vehicle.

Operation of the mobile communication terminal provided with a hands-free function according to the present invention will be explained with reference to  
5 Figures 3 to 9 in more detail.

In the mobile communication terminal, the user directly inputs a calling party's telephone number by using the key inputting unit 110 and then presses a calling key to call with the calling party, and when a calling is received from the calling party, the user presses the calling key to call with the calling party. At this  
10 time, the user hears the calling party's voice through the speaker 150 and inputs voice through the microphone 140.

Figure 3 is a flow chart showing a secret call setting process according to an embodiment of the present invention.

The user sets a hands-free function at a menu screen by using the key  
15 inputting unit 110 before driving or by pressing an arbitrary key such as a preset side key (S301). At this time, the micro computer 120 powers-on the speakerphone 160, a NUM key, a voice recognition/ voice guiding function, and a voice command function, then sets volume of the speakerphone 160 and volume of a ring tone as a proper level in the vehicle, and greatly modifies a letter font size  
20 of the display unit.

Then, a secret calling function is set into the mobile communication terminal in which the hands-free function has been set (S302). The secret calling function is set by pressing an arbitrary key such as a side key installed outside the mobile communication terminal at an arbitrary time point according to the user's  
25 necessity after setting the hands-free function. When the secret calling function is

set, a calling path set as the speakerphone 160 is switched into a calling path using an earphone (S304).

The secret calling function can be set or released not only through a specific key inputting but also the user's voice command. Also, the hands-free function and the secret calling function can be set not only sequentially but also  
5 can be set independently, respectively.

Figures 4 to 9 are flow charts showing a process for connecting a calling by voice in a state that the hands-free function has been set according to the present invention, in which Figure 4 is a flow chart showing a process for  
10 originating a call according to an embodiment of the present invention, Figure 5 is a flow chart showing a voice guiding and a telephone number selecting process at the time of searching a plurality of calling parties in Figure 4, Figure 6 is a flow chart showing a voice guiding and a telephone number selecting process at the time of searching a plurality of telephone numbers in Figure 4, Figure 7 is a flow  
15 chart showing a process for receiving a call according to an embodiment of the present invention, Figure 8 is a flow chart showing call allowing and refusing processes of Figure 7, and Figure 9 is a flow chart showing a call finishing process according to an embodiment of the present invention.

First, when the hands-free function has been set to the mobile  
20 communication terminal (S401), the micro computer 120 checks whether voice relevant to a calling trial has been inputted through an output signal of the microphone 140 (S402).

When the voice relevant to a calling trial has been inputted to the microphone 140, the micro computer 120 outputs a voice guiding through the  
25 speakerphone 160. That is, if the user inputs voice of a calling connection, a



calling trial, a calling, and etc., the micro computer 120 outputs a voice guiding such as 'please leave your name after the beep'.

When the user of the mobile communication terminal inputs a calling party's name through the microphone 140 (S403), the micro computer 140 searches a mounted telephone directory (S404) thus to certify whether the calling party's name inputted by the user's voice exists (S405). At this time, the micro computer 140 displays the calling party's name inputted by the user's voice at the display unit 130 and thereby the user can certify the calling party's name has been precisely recognized.

10 When the calling party's name has been certified from the telephone directory, the micro computer 120 outputs a corresponding name to the speakerphone 160 thus to guide to the user by voice (S406) and the user checks whether the certified name is consistent with the calling party (S407).

If the searched calling party is not the calling party inputted by the user, 15 the user inputs voice such as 'He is not a corresponding calling party.' to the microphone 140 and the micro computer 120 returns the mobile communication terminal to the process for inputting a calling party's name (S403).

If the searched calling party is a desired calling party, the user inputs a voice message for admitting the search result such as 'OK', 'He is a calling party.', 20 'He is a right calling party.', and etc. to the microphone 140.

In case that the searched calling party's registration telephone number is one, the micro computer 120 originates a calling with a corresponding telephone number thus to perform a calling connection (S410). However, in case that registered telephone numbers are more than two, the micro computer 120 sequentially guides the telephone numbers by voice through the speakerphone 25

160 (S409), and when the user selects a desired telephone number, the micro computer 120 originates a calling with the selected telephone number thus to perform a calling connection (S410).

A case that the searched telephone numbers are plural will be explained  
5 in more detail with reference to Figure 6.

If telephone numbers registered for the calling party are plural (S601), the micro computer 120 outputs a voice message such as 'Plural telephone numbers are searched.' to the speakerphone 160, and outputs a voice message such as 'Where do you want to call among home, office, or cellular phone?' to the  
10 speakerphone 160 (S602).

When the user selects one to which a calling will be connected and inputs by voice to the microphone 140, the micro computer 120 guides a corresponding telephone number by voice (S603) and then tries a calling connection (S604). Herein, even if the plural telephone numbers were aforementioned by being  
15 divided into home, office, and cellular phone, more telephone numbers can be registered if necessary.

When the calling party has not been searched from the mounted telephone directory, the micro computer 120 outputs a voice message such as 'No corresponding calling party's name' to the speakerphone 160 (S411), and outputs  
20 a voice message such as 'Would you input the calling party's telephone number by voice?' to the speakerphone 160 (S412).

Then, the user inputs a certification message such as 'Yes' or 'OK' that he will input the calling party's telephone number by voice to the microphone 140 and then inputs the calling party's telephone number by voice (S413), the micro  
25 computer 120 originates a calling to the telephone number thus to perform a

calling connection (S410).

However, when the user inputs a voice message for finishing a calling trial such as 'Calling finish', 'Calling refusal', or 'NO' to the microphone 140 for a voice message such as 'Would you input the calling party's telephone number by voice?' or presses an arbitrary key such as a side key or a finishing key (S414), the micro  
5 computer 140 outputs a voice message such as 'A calling trial has been finished.' to the speakerphone 160 and then finishes the calling trial process (S415). At this time, the user does not input a calling finish command within a certain time, the micro computer 120 returns to a calling waiting state for receiving the calling  
10 party's name.

A case that several same calling party's names are searched during the process (S404) for searching the calling party's name inputted by the user will be explained in more detail with reference to Figure 5.

When the same calling party's names more than two as the calling party  
15 inputted by the user's voice are searched (S501, S502), the micro computer 120 outputs a voice message such as 'The same plural calling parties have been searched.' to the speakerphone 160 (S503), and guides telephone numbers of the searched respective calling parties to the user by voice (S504).

If the user certifies whether the guided telephone number is the calling  
20 party's telephone number (S505) and then inputs a voice message such as 'NO', 'Calling refusal', and 'He is not a corresponding calling party.' to the microphone 140, the micro computer 120 guides a next calling party's telephone number by voice (S504), and if the user inputs a voice message for allowing the search result such as 'OK', or 'He is the calling party.' to the microphone 140, the micro  
25 computer 120 originates a calling to the corresponding telephone number thus to

perform a calling connection (S506).

In case that plural calling parties having the same name as the calling party are searched, the searched calling parties' telephone numbers were sequentially guided by voice in the above process. However, identification names  
5 such as home, a company address, and a company name for identifying each calling party can be inputted by the user's voice just at the time of searching the plural calling parties, thereby certifying the calling party right now and performing a calling connection to the telephone number.

When a calling is connected by said process, the user hears the calling  
10 party's voice through the speakerphone 160, then inputs a calling voice to the microphone 140 thus to perform a calling with his desired calling party, and finishes a calling.

As shown in Figure 9, when a calling finishing signal is received from the calling party (S901) or when the user presses a side key or a finishing key preset  
15 to recognize a calling finishing if the user presses during a calling (S902), the micro computer 120 judges that a calling finishing has been requested from the user (S903) thus to finish a calling and to return to a calling waiting state.

Figures 7 and 8 are flow charts showing a process for receiving a calling in a state that the hands-free function has been set according to the present  
20 invention, in which Figure 7 is a flow chart showing a process for receiving a call according to an embodiment of the present invention and Figure 8 is a flow chart showing call allowing and refusing processes of Figure 7.

When the hands-free function of the mobile communication terminal has been set (S701), the micro computer 120 checks whether a calling request  
25 message is received from an arbitrary originating party (S702).

When the calling request message has been received, the micro computer 120 temporarily stores an originating party's call identifier (CID) and a telephone number and searches a mounted telephone directory (S703) thus to certify whether a telephone number consistent with the telephone number exists (S704).

5 At this time, it can be constructed for the micro computer 120 to guide the calling request message reception to the user by voice and then search the telephone directory.

If the calling party's telephone number exists in the mounted telephone directory (S704), the micro computer guides a calling party's name corresponding to the telephone number by voice by using a text to speech function (S705). At this  
10 time, it can be constructed for the micro computer 120 to display searched names at the display unit 130 so that the user can precisely recognize the originating party's name.

In case that the micro computer has not searched the originating party's  
15 telephone number from the mounted telephone number directory, a received telephone number is voice-guided through the speakerphone 160 (S706).

After guiding the originating party's name or telephone number by voice, the micro computer 120 outputs a voice message such as 'Would you call?' to the speaker 160 and certifies the user's voice received through the microphone 140  
20 thus to determine a calling allowance with the originating party or not. (S707). That is, when the user inputs voice for a calling allowance such as 'OK', 'Calling allowance', or 'Calling connection' to the microphone 140, the microphone 120 outputs the calling party's voice to the speakerphone 160 and transmits the user's voice inputted to the microphone 140 to the calling party by a wireless  
25 communication, thereby performing a calling between the user and the calling

party (S709).

When the calling between the user and the calling party has been finished (S709), the micro computer 120 switches the mobile communication terminal into a calling waiting state for sensing a calling request message and outputs a voice message that the calling has been finished to the speakerphone 160 (S710). Said  
5 calling finishing process is performed as the same process as a process shown in Figure 9, thereby omitting its detail explanations.

If the user inputs a voice message such as 'NO', 'Calling refusal', or 'Calling finish' to the microphone 140 when the calling party's name or telephone  
10 number are guided by voice, the micro computer 120 transmits a response message for an impossible calling to the originating party through a base station or a wireless switching center and returns to a calling waiting state (S711). At this time, the user can select a calling refusal by pressing an arbitrary key such as a side key or a finishing key instead of a voice input, and the micro computer 120  
15 informs the user that the calling has been refused by flickering a mute lamp or by using a voice message.

The process for a calling allowance or a calling finish S707 of Figure 7 will be explained with reference to Figure 8.

When an originating party's name or a telephone number of an  
20 originating calling are guided by voice (S705, S706), if the user inputs a voice message for a calling allowance to the microphone 140 (S801) or inputs a preset arbitrary key such as a calling key (S802), the micro computer 120 judges as a calling allowance (S803). However, if the user inputs a voice message relevant to a calling finish to the microphone 140 (S804) or inputs a preset arbitrary key such  
25 as a finishing key (S805), the micro computer 120 judges as a calling refusal

(S806).

A calling connection process in a secret calling according to the present invention will be explained as follows. Herein, the secret calling is performed by processes shown in Figures 4 to 7 for convenience while driving, and when there is a car occupant next the user, the user can hear the calling party's voice only by an earphone.

First of all, at the time of calling with an arbitrary originating party in the secret calling setting state, the user inputs a telephone number by using a key pad provided at the key inputting unit 110, then presses a calling key thus to connect a calling, and inputs voice to a microphone provided at an earphone while hearing the calling party's voice by the earphone under a state that calling has been connected.

When the secret calling is not necessary even if there is a car occupant, as shown in Figure 3, the user inputs a calling party's name or telephone name to the microphone 140 by voice and the micro computer 120 searches a mounted telephone directory thus to guide the search result by voice. When the user inputs a calling allowance for the searched result to the microphone 140 by voice, the micro computer 120 connects a calling with the calling party by a wireless communication. At this time, the user can switch a calling path in order to hear the calling party's voice by the speakerphone 160 or the earphone.

Also, when a calling from an arbitrary originating party is generated under a state that the secret calling has been set, as shown in Figure 7, the micro computer 120 temporarily stores the calling party's call identifier (CID) and telephone number, then informs the user that there is a calling reception through the speakerphone 160, and searches a mounted telephone directory thus to certify

whether the corresponding telephone number exists. Then, the micro computer 120 guides the calling party's name or telephone number to the user through an earphone. When the user inputs voice for a calling allowance to a mike provided at the earphone or presses an arbitrary key such as a calling key or a side key, the micro computer 120 judges as a calling allowance state thus to output the calling party's voice to the user through the earphone and transmits the user's voice inputted to the microphone to the calling party.

If it doesn't matter for a car occupant to hear calling contents or the car occupant need not a calling when a calling from an arbitrary originating party is generated, the user releases the set secret calling by pressing an arbitrary key. Then, the micro computer 12 switches a calling path from the earphone to the speakerphone 160 and inputs the user's voice to the microphone 140. That is, even if the secret calling has been set, if the user releases the secret calling setting by pressing an arbitrary key such as a side key, the micro computer 120 outputs the calling party's voice to the speakerphone 160 and recognizes voice through the microphone 140 or a mike provided at the earphone, thereby enabling for not only the user but also the car occupant to call with the calling party.

As aforementioned, in the mobile communication terminal provided with a hands-free function and the controlling method thereof according to the present invention, the user can connect a calling with a calling party by voice or can allow a calling by voice for a calling from an arbitrary originating party. Accordingly, a risk factor that the user has to press an arbitrary key or certify a display unit while driving can be removed and an operation relevant to a calling can be controlled by voice, thereby enhancing the user's convenience.

Also, in the mobile communication terminal provided with a hands-free



function and the controlling method thereof according to the present invention, a secret calling can be set according to the user's need thereby to prevent an invasion of privacy.

As the present invention may be embodied in several forms without  
5 departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds  
10 of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.